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CENCD-PE-ED-TM (CENCB-PE-HQ/29 Apr 91) (200) 1st End
Mr. Warda/Mr. Emore/tt/(312) 353-6363
SUBJECT: Chemical Contamination Summary for the Former Nike
Battery C-54 Site, Orland Park, Illinois

Commander, North Central Division, U.S. Army Corps of Engineers,
536 South Clark Street, Chicago, IL 60605-1592

FOR Commander, Buffalo District, ATTN: CENCB-PE-HQ

15 MAY 1991

1. The subject Chemical Contamination Summary is satisfactory
subject to the following comments:

a. The Chemical Contamination Summary was prepared for the
Chicago District. As such, it should be transmitted to them with a
copy furnished this office.

b. The Chemical Contamination Summary should not contain a
cost estimate or a recommendation. The cost estimate and recommen-
dation should be referenced in your transmittal memorandum and
attached but not included in the Chemical Contamination Summary.
The reason for this is that technical data should be disseminated
as soon as possible. Recommendations and associated cost esti-
mates, however, cannot be disseminated until approved.

c. The contractor conducting the study should be referenced in
section one.

2. The HQ, NCD, POC is Bob Warda, (312) 353-3679.

FOR THE COMMANDER:

wd all encl

JOHN P. D'ANIELLO, P.E.
Director, Engineering and
Planning Directorate

CF:
✓CENCC-ED-P



DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

10 APR 1991

REPLY TO
ATTENTION OF
CENCB-PE-HQ (200)

MEMORANDUM FOR Commander, North Central Division, ATTN:
Bob Warda CENCD-ED-TM, 536 South Clark Street,
Chicago, Illinois 60605-1592

SUBJECT: Chemical Contamination Summary for the Former Nike
Battery C-54 Site in Orland Park, Illinois

1. Transmitted for your use is the Chemical Contamination
Summary for the Former Nike Battery C-54 Site in Orland Park,
Illinois. The Site Number is E05IL007300.
2. I have forwarded a copy of the memorandum to Tim Kelleher,
CENCC-ED-TM.
3. My point of contact for this matter is Mr. Richard Leonard of
my Water Quality Section, who may be reached at (716) 879-4270
(FTS 292-4270).

FOR THE COMMANDER:

Enclosure

George B. Brooks
GEORGE B. BROOKS, P.E.
Chief, Engineering & Planning Division

Chemical Contamination Summary
Former Nike Battery C-54
Orland Park, Illinois

1. A contamination evaluation was performed at the Former Nike Battery C-54 site in Orland Park, Illinois. The site is owned by the Village of Orland Park. The contamination evaluation included a records review and visual site inspection along with the collection of several water and soil samples. Two groundwater monitoring wells were installed and samples were taken from each well. Runoff water samples were taken from two former launch silos and surface water samples were taken from two swampy areas on the northern half of the site. Four soil samples were collected from shallow borings, including one background sample. All samples were analyzed for total petroleum hydrocarbons, total metals, and volatile organics.

2. Well installation and sampling were carried out as planned with the exception of the installation of only two monitoring wells rather than three. Groundwater was found at various depths; well MW-01 encountered water at 11 feet, well MW-02 was drilled to 50 feet without hitting any water, and well MW-03 hit water at 27 feet. Analytical results from the sampling program indicated the following: levels of arsenic, cadmium, chromium and lead detected in the groundwater samples from both wells

were near or greater than the MCLs. All four soil samples contained elevated concentrations of arsenic, barium, cadmium, chromium, lead and silver. Total petroleum hydrocarbons were detected at levels between 29 ppm and 80 ppm in three of the four soil samples including the background sample. Toluene was the only volatile organic compound detected in the soil samples. The silo water sample from launch unit #2 contained levels of cadmium, chromium, lead and silver that were greater than the MCLs. Elevated concentrations of total petroleum hydrocarbons were detected in samples from both launch units #2 and #3. The surface water samples did not contain metals above the MCLs. Trace amounts of total petroleum hydrocarbons were detected in only one of the surface water samples.

3. The contamination evaluation performed at the site indicates that contamination may be present in the groundwater, soils, and silo water. Although contamination is present at the site, further investigation would be required to define the source(s) of contamination. Defining the source(s) of these contaminants would be difficult due to the length of time which has elapsed since the DOD use of the site and the variety of uses that the Village of Orland Park has found for the site.

4. GROUNDWATER

The results of the inorganic analyses for groundwater were compared to Maximum Contaminant Levels (MCL) which are

enforceable standards for drinking water. Table 5 contains a summary of the occurrence and concentration of metals which were detected and those that exceed MCLs in one or more wells for unfiltered samples.

5. The MCL for arsenic (0.05 mg/l) was exceeded in well MW-03 at a concentration of 0.07 mg/l (0.08 mg/l in QC split). The standard for barium (1.00 mg/l) was exceeded in MW-01. The reported concentration was 1.1 mg/l (1.2 mg/l in duplicate). The concentration of cadmium exceeded the MCL (0.01 mg/l) in both wells ranging from 0.024 mg/l to 0.043 mg/l. The MCL for chromium is 0.05 mg/l. Detected concentrations of 0.2 mg/l (0.2 mg/l in duplicate) in MW-01 and 0.19 mg/l (0.23 mg/l in QC split) in MW-03 exceeded the MCL which is based upon the hexavalent chromium ion. Total chromium was analyzed in these samples, therefore, the concentration of Cr^{+6} may be lower. Lead found in concentrations ranging from 0.23 mg/l to 0.31 mg/l exceeded the MCL of 0.05 mg/l in both wells.

6. The inorganic analyses were performed on unfiltered samples. MCLs are generally applied to monitoring well samples that have been filtered through a 0.45 micron filter. Iron and manganese are present in these waters at relatively high levels and may represent particles of iron and/or manganese hydroxides that coprecipitate and sorb heavy metals on their surfaces.

Acidification of the sample dissolves these particles and releases the metals into solution resulting in elevated levels of metals.

7. Total petroleum hydrocarbons as well as volatile organic compounds were not detected in any of the groundwater samples (Table 5). The driller's water, obtained from the Village of Orland Park Public Works Water Source, contained amounts of bromodichloromethane and chloroform that exceeded the MCL for total trihalomethanes which includes the above compounds (Table 5).

8. The QC samples analyzed include a rinsate from the groundwater sampling equipment and a trip blank. The rinsate and the trip blank did not contain any contaminants. The split sample analyzed is included in Table 5. Three QA samples were sent to the Corps of Engineers Missouri River Division (MRD) Laboratory in Omaha, Nebraska for analysis. These included a rinsate and trip blank. The rinsate sample did not contain any contaminants, however, the trip blank contained methylene chloride which is a common laboratory contaminant. The split sample contained a lower concentration of lead (0.06 mg/l) than was reported by the Contractors Laboratory (0.27 mg/l).

9. The sample analysis indicates that the groundwater contains arsenic, barium, cadmium, chromium and lead in trace amounts,

but above Safe Drinking Water Act standards. However, no total petroleum hydrocarbons were detected in any of the groundwater samples, including the driller's water. Volatile organic compounds were not detected in the groundwater at former NIKE Battery C-54.

10. SOILS

A summary of the soil analysis is presented in Table 4.

Concentrations of metals found in the soil samples were compared to average concentrations of elements in U.S. soils as reported by Shacklette, et al. (1971). Arsenic, barium, cadmium, chromium, lead and silver were detected in low concentrations in all five soil samples. The background sample (SS-04) contained all of these metals in roughly similar concentrations. Barium and chromium in all samples were within the range of the average U.S. soil concentrations. Cadmium and lead exceeded the average concentration in all but one sample; but concentrations were well within the range of U.S. soil concentrations. SS-03 contained levels of arsenic and mercury that exceeded the average concentration but which were within the range of average U.S. concentrations.

11. All samples contained trace amounts of total petroleum hydrocarbons except for sample SS-02. Sample SS-04 had the greatest value, 80 mg/kg (36 mg/kg in the duplicate).

12. Toluene, which is a common laboratory contaminant, was the only volatile organic compound detected in the soil samples (Table 4). Soil samples SS-05 (QC split from SS-01) contained 23 ug/kg of toluene and the background soil sample (SS-04) contained 51 ug/kg of toluene. The levels of both petroleum hydrocarbons and toluene found in the background soil sample (SS-04) is probably due to the Village of Orland Park's use of the site.

13. The QC samples analyzed include a rinsate from the soil sampling equipment and a trip blank. Neither of these samples contained detectable contamination. The split sample analyzed is included in Table 4. Three QA samples were sent to the COE MRD laboratory for analysis. These included a rinsate, a trip blank and a split sample. The rinsate and the trip blank did not contain detectable contamination.

14. The split sample that the COE MRD laboratory received showed slightly higher concentrations in all detected compounds except for lead. The higher value for toluene detected by the COE MRD laboratory could be the result of laboratory contamination. These variations are possible with soil samples composited and split in the field.

15. SURFACE WATER

The results of the inorganic analysis for surface water were

compared to Maximum Contaminant Levels (MCL) which are enforceable standards for drinking water. MCLs are enforced as Primary Drinking Water Regulations. The concentration of metals which were detected do not exceed MCLs in any of the samples.

16. Total petroleum hydrocarbons were detected in only one sample SW-03 (0.3 ppm) and no volatile organic compounds were found in any of the surface water samples.

17. The QC samples analyzed include a rinsate from the surface water sampling equipment and a trip blank. Both the rinsate and trip blank did not contain any contaminants. The split sample analyzed contained metals below the MCLs for drinking water and did not contain any total petroleum hydrocarbons or volatile organic compounds. Three QA samples were sent to the Corps of Engineers Missouri Division (MRD) Laboratory in Omaha, Nebraska for analysis. These included a rinsate and a trip blank. The rinsate and trip blank did not contain any contaminants. The split sample contained similar concentrations of inorganic compounds similar to those reported to the Contractor Laboratory.

18. SILLO WATER

The results of the inorganic analyses for silo water were compared to Maximum Contaminant Levels (MCL) which are enforceable standards for drinking water. MCLs are enforced as

Primary Drinking Water Regulations. Table 6 contains a summary of the occurrence and concentration of metals which were detected and those that exceed MCLs in none or more samples.

19. The analysis of silo water sample (SW-01) from launch unit #2 showed elevated amounts of cadmium, chromium, lead and silver which greatly exceed the MCL for each of the compounds (Table 6). Cadmium was detected at 0.12 mg/l and chromium was detected at 0.11 mg/l. Both are above their respective MCLs of 0.01 and 0.05 mg/l. Lead was detected at 27 mg/l or 540 times the MCL for lead (0.05 mg/l). SW-02 showed only trace amounts of metals which were well below the MCL (Table 6).

20. Total petroleum hydrocarbons were detected in each of the silo water samples (Table 6). The silo water sample from launch unit #2 contained the highest concentration (54 ppm) while the samples from launch unit #3 were lower. No volatile organic compounds were detected in either of the two silo water samples (Table 6).

21. The QC samples analyzed included a rinsate from the silo water sampling equipment and a trip blank. The trip blank did not contain any contaminants and the rinsate contained 1.0 mg/l of total petroleum hydrocarbons. The split sample analyzed is included in Table 6. Three QA samples were sent to the Corps of

Engineers Missouri River Division (MRD) laboratory in Omaha, Nebraska for analysis., These included a rinsate and a trip blank. The rinsate did not contain any contaminants. However, 1.5 mg/l of methylene chloride which is a common laboratory contaminant was detected in the trip blank.

22. The split sample (SW-10) obtained from launch unit #2 showed much lower concentrations of inorganic compounds than those detected by the Contractors Laboratory. The COE MRD laboratory detected 10 times the amount of total petroleum hydrocarbons (545 ppm) that was detected by IT (54 ppm). The Contractors lab has checked and confirms their value.

23. The sample analysis indicates that the silo water in launch Unit #2 contains elevated amounts of cadmium, chromium, lead, and silver, all of which occur above Safe Drinking Water Act Standards. Total petroleum hydrocarbons were also detected in samples from both launch units. Volatile organics were not detected in the silo water from either launch unit.

24. CONCLUSIONS & RECOMMENDATIONS

Based on soils, groundwater and silo water analytical results from samples obtained from the former NIKE Battery C-54 site, there are indications that contamination is present at the site. Elevated levels of metals are present in the unfiltered

groundwater of the monitoring wells installed for this evaluation and in the silo water of launch unit #2. Petroleum hydrocarbons were found in three of the four soil samples and both silo water samples from launch units #2 and #3. Both surface water samples contained metals at concentrations below the MCL for drinking water and petroleum hydrocarbons were detected at trace levels in one sample.

25. Cadmium, chromium and lead were found at concentrations exceeding the MCLs in the unfiltered groundwater from both wells (MW-01, MW-03). Arsenic was detected at levels above the MCL in MW-03. Petroleum hydrocarbons and volatile organic compounds were not detected in any of the groundwater samples. Soil samples SS-01, SS-03 and SS-04 (background) contained some total petroleum hydrocarbons. Toluene, a volatile organic compound, was detected in two of the four soil samples (SS-04 and SS-05).

26. The silo water sample from launch unit #2 (SW-01) showed elevated concentrations of cadmium, chromium, lead and silver in unfiltered samples which exceed the MCL for each compound. Petroleum hydrocarbons were detected in all silo water samples from both launch units #2 and #3. Volatile organic compounds were not found in any of the silo water samples.

27. The metals analysis of the groundwater and silo water samples was performed using unfiltered samples. The presence of suspended solids in both ground and silo water samples could have contributed to a higher concentration of metals than were actually present as dissolved metals in the water. However, possible sources of metals contamination that may have led to the high concentrations in both silo water and groundwater include materials and debris from DOD and Orland Park Public Works Operations above ground and from within the silos themselves. The total petroleum hydrocarbons detected within the silo water may have been a result of petroleum spills above ground that were carried in by runoff water or from the hydraulic fluid used by the silo elevators. The lack of petroleum hydrocarbons in the groundwater analyzed during this evaluation suggests that the petroleum hydrocarbons detected in the soil samples from shallow borings (3') may have originated from localized surficial spills.

28. Results from the evaluation of site C-54 indicate that contaminants are present at the site. It is difficult to define the source(s) of these contaminants due to the length of time which has elapsed since the DOD's use of the site as well as the uses the Village of Orland Park has found for the site.

29. Both groundwater and silo water should be resampled and analyses conducted on filtered and unfiltered samples.

30. COST ESTIMATE

Resampling of wells and silos with analyses for metals on filtered and unfiltered samples - \$10,000.

TABLE 4
SUMMARY OF SOILS ANALYSIS*
FORMER NIKE BATTERY C--54
ORLAND PARK, ILLINOIS

<u>Parameter</u> <u>Metals</u> (mg/kg) ⁽¹⁾	C-54-SS01 Acid <u>Storage Shed</u>	C-54-SS02 <u>Refueling Area</u>	C-54-SS03 Near <u>Northern Silo</u>	C-54-SS04 Near Site <u>Entrance</u>	C-54-SS05 QC Split <u>of SS-04</u>	<u>Average Concentrations</u> <u>of Elements in US Soils⁽⁴⁾</u>	
						<u>Average</u> <u>Concentration</u>	<u>Concentration</u> <u>Range</u>
Arsenic	8/8 ⁽²⁾	9	90	6	14	5.2	<0.1097
Barium	70/60	40	60	60	40	490	70-5,000
Cadmium	2.7/2.6	3.7	1.7	2.3	1.3	0.66 ⁽⁵⁾	0.01-22 ⁽⁵⁾
Chromium	18/17	18	14	19	11	37	3-2,000
Lead	18/18	24	23	16	22	16	<10-700
Mercury	ND	ND	0.3	ND	ND	.058	<0.0146
Silver	1/1	3	ND	1	ND	---	---
<hr/>							
<u>Total Petroleum</u> <u>Hydrocarbons</u> (mg/kg) ⁽¹⁾	29	ND	72	80	36		
<hr/>							
<u>Volatile Hazardous</u> <u>Substance List Compounds</u> (ug/kg) ⁽³⁾							
Toluene	ND	ND	ND	51	23		

(1) mg/kg = milligrams per kilogram or parts per million

(2) This sample was analyzed in duplicate

(3) ug/kg = micrograms per kilogram or parts per billion

(4) Shacklette, et al., "Elemental Composition of Surficial Materials in the Conterminous United States." Geological Survey Professional Paper 574-D, United States Government Printing Office, Washington, DC, 1971.

(5) Friberg, L.M., et. al., 1974, Cadmium in Environment, 2nd Edition CRC Press.

ND The compound was not detected at or above the indicated detection limit.

* The complete analytical data package is presented as Appendix F.

TABLE 5
SUMMARY OF GROUND WATER ANALYSIS*
FORMER NIKE BATTERY C-54
ORLAND PARK, ILLINOIS

Parameter	MCL	C-54-MW01	C-54-MW03	C-54-MW04 (QC Split for MW-01)	C-54-Driller's Water (Water Source)
<u>Metals</u>					
(mg/l) ⁽¹⁾					
Arsenic	0.05	0.04/0.04	0.07	0.08	
Barium	1.00	1.1/1.2 ⁽²⁾	0.4	0.5	ND
Cadmium	0.01	0.039/0.43	0.024	0.031	ND
Chromium	0.05	0.20/0.20	0.19	0.23	ND
Lead	0.05	0.27/0.26	0.23	0.31	ND
<u>Total Petroleum Hydrocarbons</u>					
		ND	ND	ND	ND
<u>Volatile Hazardous Substance List Compounds</u>					
(ug/kg) ⁽³⁾					
Bromodichloromethane		ND	ND	ND	9
Chloroform		ND	ND	ND	17

(1) mg/l = milligrams per liter or parts per million

(2) This sample was analyzed in duplicate

(3) ug/kg = micrograms per kilogram or parts per billion

ND The compound was not detected at or above the detection limit

* The complete analytical data package is presented as Appendix F

MCL Maximum Contaminant Level

TABLE 6
SUMMARY OF SILO AND SURFACE WATER ANALYSIS*
FORMER NIKE BATTERY C-54
ORLAND PARK, ILLINOIS

Parameter	MCL	C-54-SW01 (Launch Unit #2)	C-54-SW02 ⁽²⁾ (Launch Unit #3)	C-54-SW03 (NE of Site)	C-54-SW04 (On Site)	C-54-SW09 (QC Split of SW02)	C-54-SW11
<u>Metals</u> (mg/l) ⁽¹⁾							
Cadmium	0.01	0.12	ND/ND	ND	ND	ND	ND
Chromium	0.05	0.11	0.01/0.01	0.2	0.02	0.01	ND
Lead	0.05	27	ND/ND	ND	ND	ND	ND
Silver	0.05	0.06	ND/ND	ND	ND	ND	ND
<u>Total Petroleum</u> <u>Hydrocarbons</u> (mg/l)							
		54	3.8	0.3	ND	2.7	ND
<u>Volatatile Hazardous</u> <u>Substance List Compounds</u> (ug.kg) ⁽³⁾							
		No VOCs were found in any sample					

(1) mg/l = milligrams per liter or parts per million

(2) This sample was analyzed in duplicate

(3) ug/kg = micrograms per kilogram or parts per billion

ND The compound was not detected at or above the detection limit

MCL MCL = Maximum Contaminant Level

* The complete analytical data package is presented as Appendix F